

**A. INTRODUCTION**

This technical appendix provides the methodology and detailed calculations for the analysis of the Municipal Ability to Pay Model. The MUNIPAY model uses this methodology to determine the ability of municipalities to afford compliance costs, Superfund cleanup contributions, and penalty payments. MUNIPAY performs two separate analyses: a demographic comparison, and an affordability calculation. This appendix provides the underlying basis for each analysis in separate sections below.

**B. DEMOGRAPHIC ANALYSIS**

The demographic analysis uses U.S. Census data from 1980 and 1990 to compare the municipality to state and national norms. The comparison includes indicators for both the

community's population and income. The analysis also shows how the municipality's position has changed over time, both relative to itself and relative to changes in the state norms.

The user must enter the data for the municipality; MUNIPAY already contains databases for national norms and all 50 states. The comparison requires no run parameters, and displays its results in a single table. The demographic analysis does not give the user a specific conclusion on the municipality's demographics, but instead provides a better understanding of long-term changes in the community's resource base.

The following sections provide the details behind each one of the demographic comparison's calculations. Exhibit A-1 below displays a list of all of the variable names and their definitions that the calculations use.

| <b>Exhibit A-1</b>  |   |   |
|---|---|---|
| <b>DEMOGRAPHIC INPUT VARIABLES</b><br><b>(All Variables Entered for both 1980 and 1990)</b> |   |   |
| POP   | = | Population  |
| NOFAM   | = | Number of families                                    |
| NOABV18   | = | Population above 18 years old                         |
| NOABV65   | = | Population above 65 years old                         |
| NOINDPOV  | = | Number of individuals below 125% of the poverty level |
| MEDHV   | = | Median home value                                     |
| MEDHHINC  | = | Median household income                               |

1. **Municipality as of 1990: Calculations**

a. Population = The value that the user entered

b. Percent population below 18 =

$$\frac{POP - NOABV18}{POP} \times 100$$

c. Percent population 65 and above =

$$\frac{NOABV65}{POP} \times 100$$

d. Percent individuals below 125% of poverty =

$$\frac{NOINDPOV}{POP} \times 100$$

e. Median home value = The value that the user entered

f. Median home value as percent of state =

$$\frac{MEDHV_{Municipality}}{MEDHV_{state}} \times 100$$

g. Median household income = The value that the user entered

h. Median household income as percent of state =

$$\frac{MEDHHINC_{Municipality}}{MEDHHINC_{state}} \times 100$$

## 2. Municipality's Change since 1980: Calculations

a. Population =

$$\left( \frac{POP_{1990}}{POP_{1980}} - 1 \right) \times 100$$

b. Percent population below 18 =

$$\left( \frac{POP_{1990} - NOABV18_{1990}}{POP_{1990}} \times 100 \right) - \left( \frac{POP_{1980} - NOABV18_{1980}}{POP_{1980}} \times 100 \right)$$

c. Percent population 65 and above =

$$\left( \frac{NOABV65_{1990}}{POP_{1990}} \times 100 \right) - \left( \frac{NOABV65_{1980}}{POP_{1980}} \times 100 \right)$$

d. Percent individuals below 125% of poverty level =

$$\left( \frac{NOINDPOV_{1990}}{POP_{1990}} \times 100 \right) - \left( \frac{NOINDPOV_{1980}}{POP_{1980}} \times 100 \right)$$

e. Median home value as percent of state =

$$\left( \frac{MEDHV_{Municipality\ 1990}}{MEDHV_{state\ 1990}} \times 100 \right) - \left( \frac{MEDHV_{Municipality\ 1980}}{MEDHV_{state\ 1980}} \times 100 \right)$$

f. Median household income as percent of state =

$$\left( \frac{MEDHHINC_{Municipality\ 1990}}{MEDHHINC_{state\ 1990}} \times 100 \right) - \left( \frac{MEDHHINC_{Municipality\ 1980}}{MEDHHINC_{state\ 1980}} \times 100 \right)$$

## **C. AFFORDABILITY ANALYSIS**

The affordability analysis includes calculations for the amount of currently available funds and then, if necessary, the amount of funds available through financing. The user can accept MUNIPAY's default values for the run parameters, or customize them. The currently available funds calculation looks for any excess monies in the municipality's "General Fund" balance and, if applicable to the case, its "enterprise fund" working capital balance. If currently available funds are not sufficient to afford the environmental expenditures, the affordability analysis then assesses the municipality's current debt burden and its ability to take on additional debt to finance the environmental expenditures. MUNIPAY displays a summary table for the affordable level of environmental expenditures, plus exhibits detailing the municipality's current condition and its projected condition from the sought and affordable level of expenditures.

MUNIPAY can evaluate a municipality's ability to afford three distinct types of environmental expenditures: compliance costs, Superfund cleanup contributions, and penalty payments. In cases that involve more than one type of environmental expenditure, the user can select the priority for the different types of expenditures. MUNIPAY's default setting is for compliance costs to receive the highest priority, then a Superfund cleanup contribution, and finally a penalty payment. MUNIPAY's protocol will therefore, if necessary, apply all of the municipality's funding capability toward a higher-priority environmental expenditure leaving no funds available for lower-priority expenditures.

### **1. Currently Available Funds**

In cases where the entity is a city, town, village, or county, MUNIPAY will determine whether the municipality's General Fund has an unreserved fund balance that can provide any currently available funds for the sought environmental expenditures. If the municipality also has an enterprise fund that is relevant to the environmental expenditures, then MUNIPAY will first

determine whether the municipality's enterprise fund has a working capital balance that can provide any currently available funds for the sought environmental expenditures, and then, if necessary, also examine the General Fund. If the municipality is an independent and publicly owned utility distinct from any individual local jurisdiction, then MUNIPAY will examine only the utility's enterprise fund working capital balance.

In cases that involve more than one type of environmental expenditure, MUNIPAY's protocol will therefore, if necessary, apply all of the municipality's currently available funds toward a higher-priority environmental expenditure leaving no funds available for lower-priority expenditures.

The following sections provide the calculations behind the separate analyses for the General Fund and enterprise fund. Exhibit A-2 below displays a list of all variable names and their definitions that the calculations use.

| <b>Exhibit A-2</b>                               |   |   |
|--|---|---|
| <b>CURRENTLY AVAILABLE FUNDS INPUT VARIABLES</b> |   |   |
| UNRES  | = | General Fund ending unreserved balance  |
| CURAST   | = | Enterprise fund current assets (excluding restricted assets)  |
| CURLIAB  | = | Enterprise fund current liabilities (payable from current assets)   |
| GFBDGEXP   | = | Next year's General Fund budgeted/anticipated expenditures and net transfers out  |
| EFBDGEXP   | = | Next year's enterprise fund budgeted/anticipated expenses and net transfers out   |
| GFMINVAL   | = | Minimum value for General Fund unreserved balance as a percentage of anticipated expenditures and net transfers out (default value is 5%) |
| EFMINVAL   | = | Minimum value for enterprise fund working capital balance as a percentage of anticipated expenses and net transfers out                   |

**a. General Fund**

To calculate the currently available funds from the General Fund, the model first calculates a recommended unreserved balance, based on a percentage of anticipated expenditures and net transfers out, which a municipality should maintain as a safety factor. The model compares this recommended balance with the ending unreserved balance to determine if any excess funds are available. These calculations generate the output variables that appear below in Exhibit A-3. The formulas that the model uses to perform the calculations follow.

| <b>Exhibit A-3</b>                       |   |   |
|--|---|---|
| <b>CURRENTLY AVAILABLE FUNDS OUTPUTS</b> |   |   |
| <b>General Fund</b>                      |   |   |
| RECBAL                                   | = | General Fund recommended unreserved balance |
| GFCURFND                                 | = | General Fund currently available funds      |

***Calculations***

- a. General Fund recommended unreserved balance:

$$RECBAL = GFMINVAL \times GFBDGEXP$$

- b. General Fund currently available funds:

$$GFCURFND = UNREBAL - RECBAL$$

**b. Enterprise Fund**

For municipalities with a relevant enterprise fund, the model calculates the currently available funds from the enterprise fund's working capital balance. If these funds are not sufficient to pay for the environmental expenditures, then it also calculates the currently available funds from the General Fund balance as above. (For publicly owned utilities the model calculates only the currently available funds from the utility's working capital balance.)

Calculations for currently available funds from the working capital balance of an enterprise fund or utility are similar to those outlined above. The model first calculates the fund's current working capital balance. This allows the model then to compute a recommended working capital balance as a percentage of anticipated expenses and net transfer out, and compare this with the current working capital balance to determine if any excess funds are available. These calculations generate the output variables that appear below in Exhibit A-4. The formulas that the model uses to perform the calculations follow.

| <b>Exhibit A-4</b>                       |   |   |
|--|---|---|
| <b>CURRENTLY AVAILABLE FUNDS OUTPUTS</b> |   |   |
| <b>Enterprise Fund or Utility</b>        |   |   |
| WRKCAP                                   | = | Enterprise fund working capital balance                             |
| EFEXPBDG                                 | = | Enterprise fund budgeted/anticipated expenses and net transfers out |
| RECWRK                                   | = | Enterprise fund recommended working capital balance                 |
| EFCURFND                                 | = | Enterprise fund currently available funds                           |



### *Calculations*

- a. Enterprise fund working capital balance:

$$WRKCAP = CURAST - CURLIAB$$

- b. Enterprise fund recommended working capital balance:

$$RECWRK = EFMINVAL \times EFBDGEXP$$

- c. Enterprise fund currently available funds:

$$EFCURFND = WRKCAP - RECWRK$$

## **2. Funds Available through Financing**

If currently available funds from the General Fund unreserved fund balance and/or the enterprise fund working capital balance are insufficient to cover the full amount of the sought environmental expenditures, MUNIPAY examines the funds available through future debt financing. Debt financing can take the form of bond issues to pay for compliance costs or Superfund cleanup contributions, or a payment schedule for a penalty. The amount of sought debt financing is equal to the total sought amount minus currently available funds.<sup>1</sup>

For a city, town, village, or county without an enterprise fund relevant to the environmental expenditures, MUNIPAY examines the capacity for general obligation bonds.<sup>2</sup> If the municipality has a relevant enterprise fund, MUNIPAY examines the capacity for revenue bonds.<sup>3</sup> In either case,

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<sup>1</sup> MUNIPAY also adds a small percentage to debt financing of compliance costs and Superfund contributions to account for the transaction costs of issuing bonds.

<sup>2</sup> General obligation bonds, often called full faith and credit bonds, derive their repayment security from the full taxing and revenue-generating capacity of a municipality. Debt service payments for these types of bonds come from local taxes, usually the local property tax. If the taxes levied are insufficient to meet payments, the local authority is legally required to raise the tax rate or broaden the tax base to generate sufficient funds.

<sup>3</sup> Revenue bonds derive their repayment security from the revenues that the debt-funded project generates. For example, wastewater disposal charges cover debt service on bonds issued to build  
(continued...)

MUNIPAY first computes various ratios that indicate the municipality's current debt burden. After this computation it determines if the highest-priority category of the sought environmental expenditures are affordable and, if not, what the maximum affordable amount is. Keeping with the user-chosen hierarchy of the three types of environmental expenditures, MUNIPAY then examines the debt capacity remaining for the next-highest priority of environmental expenditures, and then the final category. If necessary, MUNIPAY will exhaust all of the municipality's debt capacity on a higher-priority environmental expenditure, leaving no financing available for lower-priority expenditures.

The following sections provide the details behind the calculations for funds available through future debt financing.

**a. General Obligation Debt**

For a city, town, village, or county, MUNIPAY assesses the municipality's ability to finance new general obligation debt. In broad terms, MUNIPAY analyzes the municipality's current and projected obligations from the perspective of three criteria: total debt stock (i.e., various measures of the total amount of debt), annual debt flow (i.e., debt service or payments), and incremental household burden.

The analysis proceeds through the examination of several ratios that are relevant to the criteria listed above. The specific ratios that the model analyzes include:

- State-government-imposed direct net debt limit
- Direct net debt per capita
- Overall net debt per capita
- Direct net debt to property value

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<sup>3</sup> (...continued)

a new wastewater treatment plant. Hence, the cost of these bonds is borne by those paying for the services the funded project provides.

- Overall net debt to property value
- Debt service ratio
- Property tax incremental burden

For each ratio, MUNIPAY first calculates the existing value. The model then analyzes the impact of the proposed new financing burden on these ratios, beginning with the highest-priority sought expenditures, and compares the projections with threshold values for each ratio. If any of the projected ratios exceeds its threshold value, the total proposed financing is not affordable. The model then calculates the maximum amount of new financing that is affordable, given the user-specified parameters and threshold values. If the amount sought is affordable, the model then performs the same analysis for the next-highest priority expenditures, and finally for the lowest-priority expenditures.

The model contains default values for the ratio thresholds and run parameters (e.g., interest rates, bond maturity periods). The user may modify these values if a particular analysis warrants it. A full list of these parameters, their definitions, and their default values appear in Exhibit A-5. In addition, the user must provide certain input variables, including the sought amounts, for MUNIPAY to perform its analysis. A list of these input variables and their definitions appears in Exhibit A-6.

Using these parameters and inputs, MUNIPAY first performs some preliminary calculations, including the existing ratios discussed above. MUNIPAY then proceeds to test the thresholds, first (assuming the default hierarchy of priorities) for compliance costs, then for Superfund contributions, and finally for penalty payments. The formulas to calculate and test the ratios appear below. To avoid duplication, the text documents the formulas for compliance costs only. While some parameters are specific to the type of environmental expenditure (e.g., interest rate and maturity period), the same basic formulas still apply to the ratios. Note, however, that the additional debt necessary to finance the highest-priority environmental expenditure is included in the analysis of the municipality's ability to afford new debt for subsequent environmental expenditures.

**Exhibit A-5**

**PARAMETERS FOR AFFORDABILITY ANALYSIS  
General Obligation Debt**

|          |   |  |
|----------|---|--|
| COMPYRS  | = | Maturity period for bond to finance compliance capital and one-time costs (Default = 25 years)   |
| SUPYRS   | = | Maturity period for note to finance Superfund cost contribution (Default = 5 years)  |
| PENYRS   | = | Time period for penalty payment schedule (Default = 3 years)   |
| COMPINT  | = | General obligation debt interest rate for compliance financing (Default based on entity's bond rating, assuming a 25-yr bond)  |
| SUPINT   | = | General obligation debt interest rate for Superfund financing (Default based on entity's bond rating, assuming a 5-yr note)  |
| PENINT   | = | Federal funds interest rate for penalty payment schedule (Default is most recent Federal funds rate)   |
| GFMINVAL | = | Minimum value for General Fund unreserved balance as a percentage of budgeted/anticipated cash out flows (Default = 5%)  |
| MAXINCR  | = | Maximum value for increase in property taxes in median home value as a percentage of median household income (Default = 1.0%)  |
| MAXSERV  | = | Maximum value for debt service ratio (Default = 25%)   |
| MAXDCP   | = | Maximum value for direct net debt per capita (Default based on national median values for entities of similar type and size as identified by Moody's, increased by a multiplying factor) |
| MAXOCP   | = | Maximum value for overall net debt per capita (Default same as above)  |
| MAXDPRP  | = | Maximum value for direct net debt as a percentage of market value for taxable property (Default same as above)   |
| MAXOPRP  | = | Maximum value for overall net debt as a percentage of market value for taxable property (Default same as above)  |
| MOODYS   | = | Multiplying factor applied to national median values for parameters above (Default = 2.5)  |

**Exhibit A-6**

**INPUT VARIABLES FOR AFFORDABILITY ANALYSIS**  
**General Obligation Debt**

|          |   |   |
|----------|---|---|
| COMPCAP  | = | Amount sought for compliance capital and one-time expenditures        |
| COMPANN  | = | Amount sought for compliance annual expenditures                      |
| SUPERFUN | = | Amount sought for Superfund cleanup contribution                      |
| PENPAY   | = | Amount sought for penalty payment                                     |
| CURREVS  | = | Total revenues for all governmental fund types                        |
| CURREPAY | = | Total principal and interest payments for all governmental fund types |
| TOTVAL   | = | Total fair market value of taxable property                           |
| COLRATE  | = | Property tax collection rate  |
| RECPOP   | = | Most recent estimate for population                                   |
| RECYR    | = | Year for most recent population estimate                              |
| PRIPOP   | = | Prior estimate for population   |
| PRIYR    | = | Year for prior population estimate                                    |
| RECMHI   | = | Most recent estimate for median household income                      |
| MHIYR    | = | Year for most recent median household income estimate                 |
| RECMHV   | = | Most recent estimate for median home value                            |
| MHVYR    | = | Year for most recent median home value estimate                       |
| CURDIR   | = | Direct net debt   |
| CUROVER  | = | Overall net debt  |
| RATING   | = | Most recent general obligation debt rating                            |
| STATELIM | = | State limit for general obligation debt level                         |
| GFBDGEXP | = | Next year's budgeted/anticipated expenditures and net transfers out   |

## ***Preliminary Calculations***

MUNIPAY first generates several preliminary figures for use in subsequent calculations. A list of these variables and their definitions appear in Exhibit A-7. The formulas to derive them follow.

| <b>Exhibit A-7</b>  |   |   |
|---|---|---|
| <b>AFFORDABILITY ANALYSIS PRELIMINARY CALCULATION VARIABLES</b> |   |   |
| <b>General Obligation Debt</b>                                  |   |   |
| CURPOP  | = | Current population of municipality  |
| CURMHI  | = | Current median household income, equal to RECMHI adjusted for inflation to the current year using the Consumer Price Index (CPI)                          |
| CURMHV  | = | Current median home value, equal to RECMHV adjusted for inflation to the current year using the CPI   |
| TAXBASE   | = | Effective proportion of taxable property on which taxes are collected (i.e., market value of taxable property multiplied by property tax collection rate) |
| INTRATIO  | = | Ratio of projected total principal and interest payments to principal amount (based on interest rate and period of financing)                             |

- a. Current population =

$$RECPOP \times \left[ \left( \frac{RECPOP}{PRIPOP} \right) \left( \frac{1}{REC_{YR} - PRI_{YR}} \right) \right]^{(currentyear - PRI_{YR})}$$

- b. Current median household income =

$$RECMHI \times \left( \frac{CPI_{currentyear}}{CPI_{MHI_{YR}}} \right)$$

- c. Current median home value =

$$RECMHV \times \left( \frac{CPI_{currentyear}}{CPI_{MHVYR}} \right)$$

- d. Taxbase (proportion of taxable property on which taxes are collected) =

$$TOTVAL \times COLRATE$$

- e. Ratio of projected total principal and interest payments to principal amount =

$$n \left[ \frac{i(1+i)^n}{(1+i)^n - 1} \right]$$

Where:      i = interest rate (COMPINT, SUPINT or PENINT)  
                  n = period of financing (COMPYRS, SUPYRS, or PENYRS)

Using these calculations and the input variables that the user has entered, MUNIPAY now calculates the existing and projected ratios for the debt stock, debt flow, and incremental property tax burden. (The existing ratios are displayed on the outputs page for comparison.) The formulas for these ratios appear below.

### ***Debt Stock Criterion***

#### ***Existing Ratios***

$$\text{Current direct net debt per capita (in \$)} = \frac{CURDIR}{CURPOP}$$

$$\text{Current overall net debt per capita (in \$)} = \frac{CUROVER}{CURPOP}$$

$$\text{Current direct net debt to property value (as \%)} = \left( \frac{CURDIR}{TOTVAL} \right) \times 100$$

$$\text{Current overall net debt to property value (as \%)} = \left( \frac{CUROVER}{TOTVAL} \right) \times 100$$

### ***Projected Ratios***

$$\text{Projected direct net debt per capita} = \frac{CURDIR + COMPCAP}{CURPOP}$$

$$\text{Projected overall net debt per capita} = \frac{CUROVER + COMPCAP}{CURPOP}$$

$$\text{Projected direct net debt to property value} = \left( \frac{CURDIR + COMPCAP}{TOTVAL} \right) \times 100$$

$$\text{Projected overall net debt to property value} = \left( \frac{CUROVER + COMPCAP}{TOTVAL} \right) \times 100$$

If any of the projected ratios exceeds its specified threshold value, then the municipality is unable to finance the sought amount. In this case, the model calculates the maximum affordable amount for each of the four ratios above, based on the specified threshold values. The formulas for calculating the four threshold amounts are:

- (1)  $(MAXDCP \times CURPOP) - CURDIR$
- (2)  $(MAXOCP \times CURPOP) - CUROVER$



$$(3) \quad (MAXDPRP \times TOTVAL) - CURDIR$$

$$(4) \quad (MAXOPRP \times TOTVAL) - CUROVER$$

The minimum value of these four amounts is the maximum amount of new debt stock that the municipality can afford.

### ***Debt Flow Criterion***

$$\text{Existing debt service ratio} = \frac{CURREPAY}{CURREVS}$$

$$\text{Projected debt service ratio} = \frac{(CURREPAY + NEWSERV)}{(CURREVS + NEWSERV)}$$

Where NEWSERV, the projected amount of annual new debt service as a result of sought compliance expenditures =

$$COMPCAP \times \frac{INTRATIO}{COMPYRS}$$

If the projected debt service ratio exceeds the threshold, then MUNIPAY calculates the maximum affordable new debt service, and from this calculates the maximum amount that the municipality can afford to finance. If this maximum amount is greater than the amount from the debt stock criterion calculations above, then the lesser amount (i.e., the debt stock amount) is the affordable amount. The following are the calculations for maximum affordable debt service and the corresponding maximum amount to be financed, based on the maximum debt service ratio.

Maximum new debt service =

$$\frac{(MAXSERV \times CURREVS) - CURPRIN - CURINT}{(1 - MAXSERV)}$$

Maximum amount to be financed =

$$Above\ amount \times \frac{COMPYRS}{INTRATIO}$$

### ***Incremental Property Tax Burden Calculation***

The final threshold ratio that MUNIPAY tests for general obligation financing is the incremental increase in household property tax burden. The model calculates the projected increase in annual property taxes for households in the municipality as a result of the new debt service incurred from the sought environmental expenditures. If this increase exceeds the specified threshold, then the model calculates the maximum affordable new debt service, and from this the maximum amount of financing that the municipality can afford. Again, if this amount is greater than the maximum amount from the debt flow criterion calculations above, the lesser amount prevails. The formulas for these calculations are as follows.

Projected increase in property tax burden =

$$\frac{NEWSERV}{TAXBASE} \times \frac{CURMHV}{CURMHI}$$

Where NEWSERV is defined as above under Debt Flow Criterion

Maximum new debt service =

$$\frac{MAXINCR \times CURMHI}{CURMHV \times TAXBASE}$$

Maximum amount to be financed =

$$\text{Above amount} \times \frac{\text{COMPYRS}}{\text{INTRATIO}}$$

## **b. Revenue Debt**

For cases involving a municipality with a relevant enterprise fund or publicly owned utility, MUNIPAY assesses the entity's ability to finance new revenue debt. As with general obligation debt, the model analyzes a series of ratios and threshold values based on debt stock, flows and household burdens to determine if the enterprise fund or utility can afford to take on new debt.

Specifically, the model analyzes four sets of ratios:

- User fee incremental burden
- User fee total burden
- Debt service coverage ratio<sup>4</sup>
- Debt-to-equity ratio

As with general obligation scenarios, the model first calculates the existing values. It then analyzes the impact of the proposed new financing burden on these ratios, beginning with compliance costs. If any of the projected ratios exceeds the threshold (except debt service coverage ratio, as explained in the footnote) the model calculates the maximum affordable amount of new financing.

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<sup>4</sup> The debt service coverage ratio is not a stand-alone threshold like other thresholds the model employs. Debt service coverage is the ratio of an enterprise fund's net revenues (operating revenues minus operating expenses) to its principal and interest payments. It indicates whether user fee levels are sufficient to generate a positive net income capable of adequately servicing the entity's existing level of debt. The model sets this ratio at 120 percent, and uses this minimum value to determine what increased level of user fees are necessary both to cover existing debt and to cover any proposed debt. Thus, unlike the other criteria in the model, the debt service coverage ratio is not a limit in itself but instead works in conjunction with the user fee burden criteria to become a limiting factor.

The model contains default values for the revenue debt ratio thresholds, along with other parameters relevant to the analysis. The user must also provide input variables similar to the general obligation case. Lists of the parameters and input variables, together with their definitions and default values, appear in Exhibits A-8 and A-9. The formulas that the model uses for its analysis follow.

**Exhibit A-8**

**PARAMETERS FOR AFFORDABILITY ANALYSIS**  
**Revenue Debt**

|          |   |   |
|----------|---|---|
| COMPYRS  | = | Maturity period for bond to finance compliance capital and one-time costs (Default = 25 years)                                      |
| SUPYRS   | = | Maturity period for note to finance Superfund cost contribution (Default = 5 years)   |
| PENYRS   | = | Time period for penalty payment schedule (Default = 3 years)  |
| COMPINT  | = | Revenue debt interest rate for compliance financing (Default based on entity's bond rating, assuming a 25-yr bond)                  |
| SUPINT   | = | Revenue debt interest rate for Superfund financing (Default based on entity's bond rating, assuming a 5-yr note)                    |
| PENINT   | = | Federal funds interest rate for penalty payment schedule (Default is most recent Federal funds rate)                                |
| GFMINVAL | = | Minimum value for General Fund unreserved balance as a percentage of budgeted/anticipated cash outflows (Default = 5%)              |
| EFMINVAL | = | Minimum value for enterprise fund working capital balance as a percentage of budgeted/anticipated cash outflows (Default = 5%)      |
| MAXINCR  | = | Maximum value for increase in user charges on 90,000 gallon consumption as a percentage of median household income (Default = 1.0%) |
| MAXVAL   | = | Maximum value for total user charges on 90,000 gallon consumption as a percentage of median household income (Default = 2.0%)       |
| MINCOV   | = | Minimum value for debt service coverage ratio (Default = 120%)  |
| MAXDTEQ  | = | Maximum value for debt-to-equity ratio (Default = 200%)   |

**Exhibit A-9**

**INPUT VARIABLES FOR AFFORDABILITY ANALYSIS**  
**Revenue Debt**

|          |   |  |
|----------|---|--|
| COMPCAP  | = | Amount sought for compliance capital and one-time expenditures |
| COMPANN  | = | Amount sought for compliance annual expenditures               |
| SUPERFUN | = | Amount sought for Superfund cleanup contribution               |
| PENPAY   | = | Amount sought for penalty payment                              |
| CURAST   | = | Current assets   |
| CURLIAB  | = | Current liabilities  |
| TOTLIA   | = | Total liabilities  |
| TOTEQ    | = | Total equity   |
| OPREV    | = | Operating revenues   |
| OPEXP    | = | Operating expenses   |
| CURREPAY | = | Annual principal and interest payments                         |
| CURFEE   | = | Annual residential charges on 90,000 gallon consumption        |
| SERVAREA | = | Number of serviced households                                  |
| RESPOR   | = | Residential portion of system revenue                          |
| RECMHI   | = | Most recent estimate for median household income               |
| MHIYR    | = | Year for most recent median household income estimate          |
| RECMHV   | = | Most recent revenue debt rating                                |
| MHVYR    | = | Year for most recent median home value estimate                |
| CURDIR   | = | Direct net debt  |
| CUROVER  | = | Overall net debt   |
| RATING   | = | Most recent general obligation debt rating                     |

As with general obligation debt, MUNIPAY makes several preliminary calculations. For a list of the output variables and the formulas that derive them, see the preceding section for general obligation debt (specifically, Exhibit A-7 and formulas “a” through “e” immediately following the exhibit). Using these variables and the user’s input variables, MUNIPAY calculates the existing and projected ratios for the criteria and tests them against the threshold values.

### ***User Fee Burden Criteria***

To test the two user fee burden criteria (incremental and total burden), the model first calculates the additional annual revenue requirements (REVREQ) for the sought amount of financing. This amount is then expressed in terms of the increased annual residential user fee burden per household (RESBUR). The model then calculates the incremental user fee increase and new user fee total burden as a percentage of median household income and tests these ratios against the specified thresholds.

$$\begin{aligned} \text{Additional annual revenue requirements (REVREQ)} = \\ [MINCOV \times (NEWSERV + CURREPAY)] - OPREV + OPEXP + COMPANN \end{aligned}$$

Increased annual burden per household (RESBUR) =

$$REVREQ \times \frac{RESPOR}{SERVAREA}$$

Increased annual burden as a percentage of median household income =

$$\frac{RESBUR}{CURMHI} \times 100$$

Total user fee burden as a percentage of median household income =

$$\frac{(RESBUR + CURFEE)}{CURMHI} \times 100$$

If either of the two user fee criteria exceeds the threshold, MUNIPAY calculates the maximum user fee increase per household (MAXBUR). It then uses this amount to “work backwards” into an affordable amount that can be financed. First, the model translates the maximum per household fee into a system-wide total amount (MAXSYS), which is simply another way of expressing the maximum additional revenue requirements for the municipality. This amount is converted into the maximum additional annual debt service (DEBTSERV) that the municipality can afford. The model uses this debt service amount to calculate the maximum amount of new financing that the municipality can afford (AFFORD). Formulas for these calculations follow.

Maximum user fee increase per household (MAXBUR) = The lesser of:

$$MAXINCR \times CURMHI$$

or

$$(MAXVAL \times CURMHI) - CURFEE$$

Maximum user fee increase, system-wide (MAXSYS) =

$$MAXBUR \times \frac{SERVAREA}{RESPOR}$$

Maximum affordable new debt service (DEBTSERV) =

$$\left( \frac{OPREV - OPEXP - COMPANN + MAXSYS}{MINCOV} \right) - CURPRIN - CURINT$$

Maximum affordable new financing (AFFORD) =

$$DEBTSERV \times \frac{YEARS}{INTRATIO}$$



### ***Debt-to-Equity Criterion***

Once the model establishes the maximum affordable amount to be financed based on the user fee criteria, it then tests this amount against the debt-to-equity threshold. The existing debt-to-equity ratio is defined simply as total liabilities divided by total equity:

$$\frac{TOTLIA}{TOTEQ}$$

Therefore, the projected debt-to-equity ratio =

$$\frac{TOTLIA + AFFORD}{TOTEQ}$$

If the projected debt-to-equity ratio is greater than the threshold, the model calculates the maximum amount that can be financed given the specified debt-to-equity limit, using the formula:

$$(MAXDTEQ \times TOTEQ) - TOTLIA$$